USB-PDISO8/40

USB-based Isolated Input and Relay Output

User's Guide

MEASUREMENT COMPUTING

USB-PDISO8/40

USB-based
Isolated Input and Relay Output

User's Guide

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About this User's Guide

What you will learn from this user's guide

This user's guide explains how to install, configure, and use the USB-PDISO8/40 so that you get the most out of its USB-based isolated input/relay output features..

Conventions in this user's guide

For more information

Text presented in a box signifies additional information related to the subject matter.

Caution! Shaded caution statements present information to help you avoid injuring yourself and others, damaging your hardware, or losing your data.

bold text **Bold** text is used for the names of objects on a screen, such as buttons, text boxes, and check boxes.

italic text *Italic* text is used for the names of manuals and help topic titles, and to emphasize a word or phrase.

Where to find more information

Additional information about USB-PDISO8/40 hardware is available on our website at www.mccdaq.com. You can also contact Measurement Computing Corporation with specific questions.

- Knowledgebase: kb.mccdaq.com
- Tech support form: www.mccdaq.com/support/support_form.aspx
- Email: techsupport@mccdaq.com
- Phone: 508-946-5100 and follow the instructions for reaching Tech Support

For international customers, contact your local distributor. Refer to the International Distributors section on our website at www.mccdaq.com/International.

Introducing the USB-PDISO8/40

This user's guide contains all of the information you need to install, configure, and program the USB-PDISO8/40.

The USB-PDISO8/40 is a USB 1.1 low-speed device that is used for data acquisition and control. The USB-PDISO8/40 is supported under popular Microsoft® Windows® operating systems, and is fully compatible with both USB 1.1 and USB 2.0 ports.

The USB-PDISO8/40 offers eight single pole double throw (SPDT) Form C relay outputs and eight isolated high voltage digital inputs. The inputs monitor 24V AC or DC inputs. The relay outputs provide 6 Amp outputs at 240 VAC or 28 VDC.

You can configure each isolated input with an optional input filter. The input filters are enabled and disabled by software.

The USB-PDISO8/40 is shown in Figure 1-1. All I/O connections are made to a 40-pin connector.

The USB-PDISO8/40 is powered by an external 9 V, 1 A regulated power supply that is shipped with the device. The USB-PDISO8/40 is shipped in a rugged enclosure that you can mount on a DIN rail or on a bench.

Software features

For information on the features of *Insta*Cal and the other software included with your USB-PDISO8/40, refer to the *Quick Start Guide* that shipped with your device. The *Quick Start Guide* is also available in PDF at www.mccdaq.com/PDFs/manuals/DAQ-Software-Quick-Start.pdf.

Check www.mccdaq.com/download.htm for the latest software version or versions of the software supported under less commonly used operating systems.

USB-PDISO8/40 block diagram

USB-PDISO8/40 functions are illustrated in the block diagram shown here.

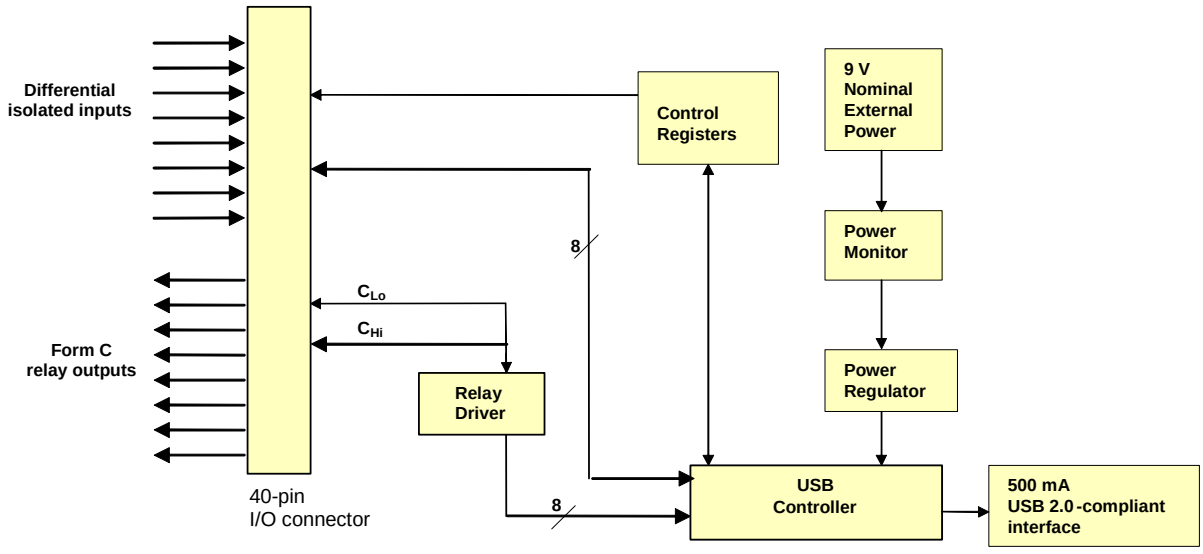


Figure 1-1. USB-PDISO8/40 functional block diagram

Connecting a USB-PDISO8/40 to your computer is easy

Installing a data acquisition device has never been easier.

- The USB-PDISO8/40 relies upon the Microsoft Human Interface Device (HID) class drivers. The HID class drivers ship with every copy of Windows that is designed to work with USB ports. We use the Microsoft HID because it is a standard, and its performance delivers full control and maximizes data transfer rates for your USB-PDISO8/40. No third-party device driver is required.
- The USB-PDISO8/40 is plug-and-play. There are no jumpers to position, DIP switches to set, or interrupts to configure.
- You can connect the USB-PDISO8/40 before or after you install the software, and without powering down your computer first. When you connect an HID to your system, your computer automatically detects it and configures the necessary software. You can connect and power multiple HID peripherals to your system using a USB hub.
- You can connect your system to various devices using a standard four-wire cable. The USB connector replaces the serial and parallel port connectors with one standardized plug and port combination.
- Data can flow two ways between a computer and peripheral over USB connections.

Make sure that you have the latest Windows Updates installed for your USB driver, particularly "XP Hotfix KB822603."

Installing the USB-PDISO8/40

What comes with your USB-PDISO8/40 shipment?

As you unpack your USB-PDISO8/40, make sure that the following components are included.

Hardware

- USB-PDISO8/40

- USB cable (2 meter length)

- External power supply and cord (CB-PWR-9) – 9 volt, 1 amp DC power supply

Additional documentation

In addition to this hardware user's guide, you should also receive the *Quick Start Guide* (available in PDF at www.mccdaq.com/PDFs/manuals/DAQ-Software-Quick-Start.pdf). This booklet supplies a brief description of the software you received with your USB-PDISO8/40 and information regarding installation of that software. Please read this booklet completely before installing any software or hardware.

Optional components

- Cables

C40-37F-*x*

C40F-37M-2

C40FF-x

Unpacking the USB-PDISO8/40

As with any electronic device, you should take care while handling to avoid damage from static electricity. Before removing the USB-PDISO8/40 from its packaging, ground yourself using a wrist strap or by simply touching the computer chassis or other grounded object to eliminate any stored static charge.

If any components are missing or damaged, notify Measurement Computing Corporation immediately by phone, fax, or e-mail:

- Phone: 508-946-5100 and follow the instructions for reaching Tech Support.
- Fax: 508-946-9500 to the attention of Tech Support
- Email: techsupport@mccdaq.com

Installing the software

Refer to the *Quick Start Guide* for instructions on installing the software on the *Measurement Computing Data Acquisition Software CD*. This booklet is available in PDF at www.mccdaq.com/PDFs/manuals/DAQ-Software-Quick-Start.pdf.

Installing the USB-PDISO8/40

Before you connect the USB-PDISO8/40 to your computer, connect the external power supply that was shipped with the device.

You can connect up to four compatible Measurement Computing USB products in a daisy chain configuration to a single USB 1.1 port or USB 2.0 port on your computer.

Connecting the external power supply

Power to the USB-PDISO8/40 is provided with the +9 V external power supply (CB-PWR-9). You must connect the external power supply *before* connecting the USB cable to the USB-PDISO8/40 and your computer.

If you are connecting more than one Measurement Computing USB product, make sure that you provide adequate power to each device. Refer to the "Power limitations using multiple USB-PDISO8/40 devices" section on page 3-3.

To connect the power supply to your USB-PDISO8/40, connect the external power cord to the power connector labeled **POWER IN** on the USB-PDISO8/40 enclosure (**PWR IN** on the board). Refer to Figure 3-1 on page 3-1 for the location of this connector.

The **PWR** LED illuminates green when +9 V power is supplied to the USB-PDISO8/40. If the voltage supply is less than +6.5 V or more than +12.5 V, the **PWR** LED does not light.

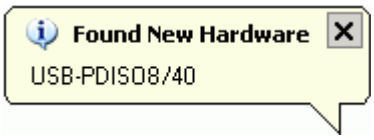
Do not connect external power to the POWER OUT connector

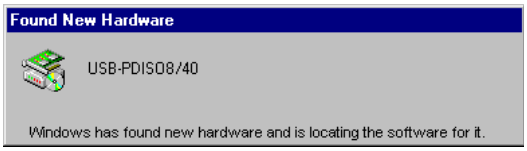
The power connector labeled **POWER OUT** on the enclosure (**PWR OUT** on the board) is used to provide power to an additional Measurement Computing USB product. If you connect the external power supply to the **POWER OUT** connector, the USB-PDISO8/40 does not receive power, and the **PWR** LED does not illuminate.

Connecting the USB-PDISO8/40 to your system

To connect the USB-PDISO8/40 to your system, connect the USB cable to a USB port on your computer or to an external USB hub that is connected to your computer. The USB cable provides communication to the USB-PDISO8/40.

When you connect the USB-PDISO8/40 for the first time, multiple **Found New Hardware** pop up balloons (Windows XP) or dialogs (other Windows versions) appear as the USB-PDISO8/40 is detected.





If you are running Windows XP and connect the USB-PDISO8/40 to a USB 1.1 port, a balloon displays the message "**Your USB device can perform faster if you connect to a USB 2.0 port**." You can ignore this message. The USB-PDISO8/40 will function properly when connected to a USB 1.1 port, although USB bandwidth will be limited.

When installation is complete, the **USB LED** should flash and then remain lit. This indicates that communication is established between the USB-PDISO8/40 and your computer.

If the USB LED turns off

If the USB LED is lit but then turns off, the computer has lost communication with the USB-PDISO8/40. To restore communication, disconnect the USB cable from the computer, and then reconnect it. This should restore communication, and the USB LED should turn back *on*.

Caution! Do not disconnect **any** device from the USB bus while the computer is communicating with the USB-PDISO8/40, or you may lose data and/or your ability to communicate with the USB-PDISO8/40.

If your system does not detect the USB-PDISO8/40

If a "**USB device not recognized**" message appears when you connect the USB-PDISO8/40, do the following.

1. Unplug the USB cable from the USB-PDISO8/40.
2. Unplug the external power cord from the **POWER IN** connector on the enclosure.
3. Plug the external power cord back into the **POWER IN** connector.
4. Plug the USB cable back into the USB-PDISO8/40.

Your system should now properly detect the USB-PDISO8/40 hardware. Contact technical support if your system still does not detect the USB-PDISO8/40.

Connecting the board for I/O operations

Connectors, cables – main I/O connector

Table 2-1 lists the board connectors, applicable cables, and compatible accessory boards.

Table 2-1. Board connectors, cables, accessory equipment

Connector	P14: 40-pin ribbon connector
Compatible cables	C40FF-x: 40-conductor ribbon cable, female both ends, x = length in feet.
	C40-37F-x: 40-pin IDC to 37-pin female D connector, x = length in feet.
Compatible accessory products (using the C40FF-x cable)	CIO-MINI40
Compatible accessory products (using the C40-37F-x cable)	CIO-MINI37 SCB-37

Pin out – main I/O connector

Table 2-2. 40-pin connector pin out (P14)

Signal Name	Pin		Pin	Signal Name
Input 7 terminal A	1	∘ ∘	2	Input 7 terminal B
Input 6 terminal A	3	∘ ∘	4	Input 6 terminal B
Input 5 terminal A	5	∘ ∘	6	Input 5 terminal B
Input 4 terminal A	7	∘ ∘	8	Input 4 terminal B
Input 3 terminal A	9	∘ ∘	10	Input 3 terminal B
Input 2 terminal A	11	∘ ∘	12	Input 2 terminal B
Input 1 terminal A	13	∘ ∘	14	Input 1 terminal B
Input 0 terminal A	15	∘ ∘	16	Input 0 terminal B
Relay 7 Common contact	17	∘ ∘	18	Relay 7 Normally Open contact
Relay 6 Common contact	19	∘ ∘	20	Relay 6 Normally Open contact
Relay 5 Common contact	21	∘ ∘	22	Relay 5 Normally Open contact
Relay 4 Normally Closed contact	23	∘ ∘	24	Relay 4 Common contact
Relay 4 Normally Open contact	25	∘ ∘	26	Relay 3 Normally Closed contact
Relay 3 Common contact	27	∘ ∘	28	Relay 3 Normally Open contact
Relay 2 Normally Closed contact	29	∘ ∘	30	Relay 2 Common contact
Relay 2 Normally Open contact	31	∘ ∘	32	Relay 1 Normally Closed contact
Relay 1 Common contact	33	∘ ∘	34	Relay 1 Normally Open contact
Relay 0 Normally Closed contact	35	∘ ∘	36	Relay 0 Common contact
Relay 0 Normally Open contact	37	∘ ∘	38	Relay 7 Normally Closed contact
Relay 5 Normally Closed contact	39	∘ ∘	40	Relay 6 Normally Closed contact

Cabling

For signal connections and termination, you can use the CIO-MINI40 screw terminal board and C40FF-x cable.

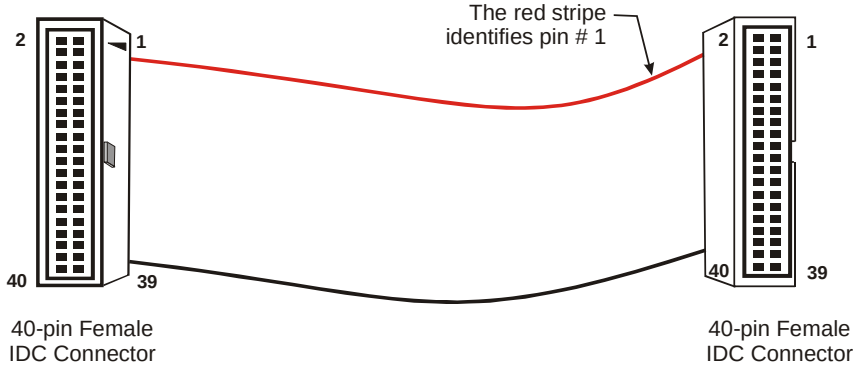


Figure 2-1. C40FF-*x* cable

For connections to 37-pin connectors or boards, you can use the C40-37F-*x* or C40F-37M-*x* cable.

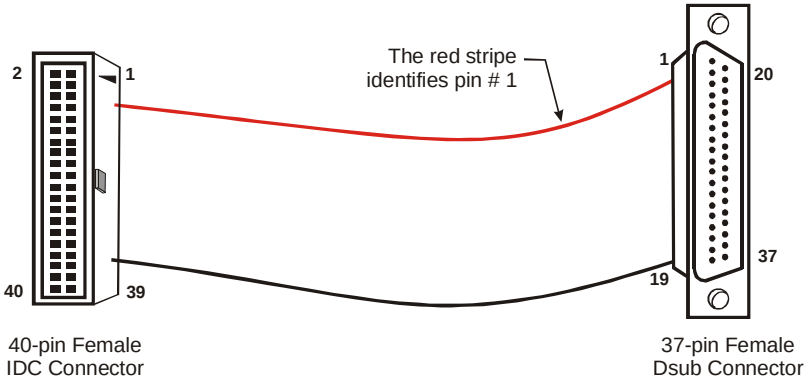


Figure 2-2. C40-37F-*x* cable

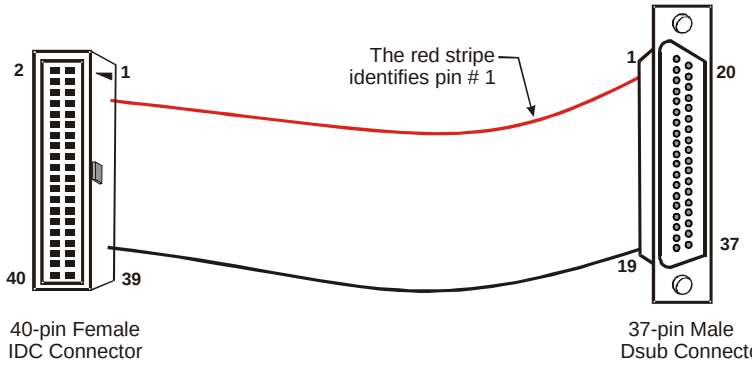


Figure 2-3. C40-37M-*x* cable

Field wiring and signal termination accessories

You can connect the USB-PDISO8/40 to the following accessory boards using the cables above.

- CIO-MINI40 – 40-pin screw terminal board.
- CIO-MINI37 – 37-pin screw terminal board.
- SCB-37 – 37-conductor, shielded signal connection box.

Functional Details

The USB-PDISO8/40 provides SPDT relay control and isolated inputs in a plug-and-play package. All I/O connections are made to a 40-pin connector (refer to Table 2-2 on page 2-4 for the signal pin out).

Internal components

The USB-PDISO8/40 has the following internal components, as shown in Figure 3-1.

- Two (2) USB connectors
- Two (2) external power connectors
- USB LED
- PWR LED
- 40-pin I/O connector

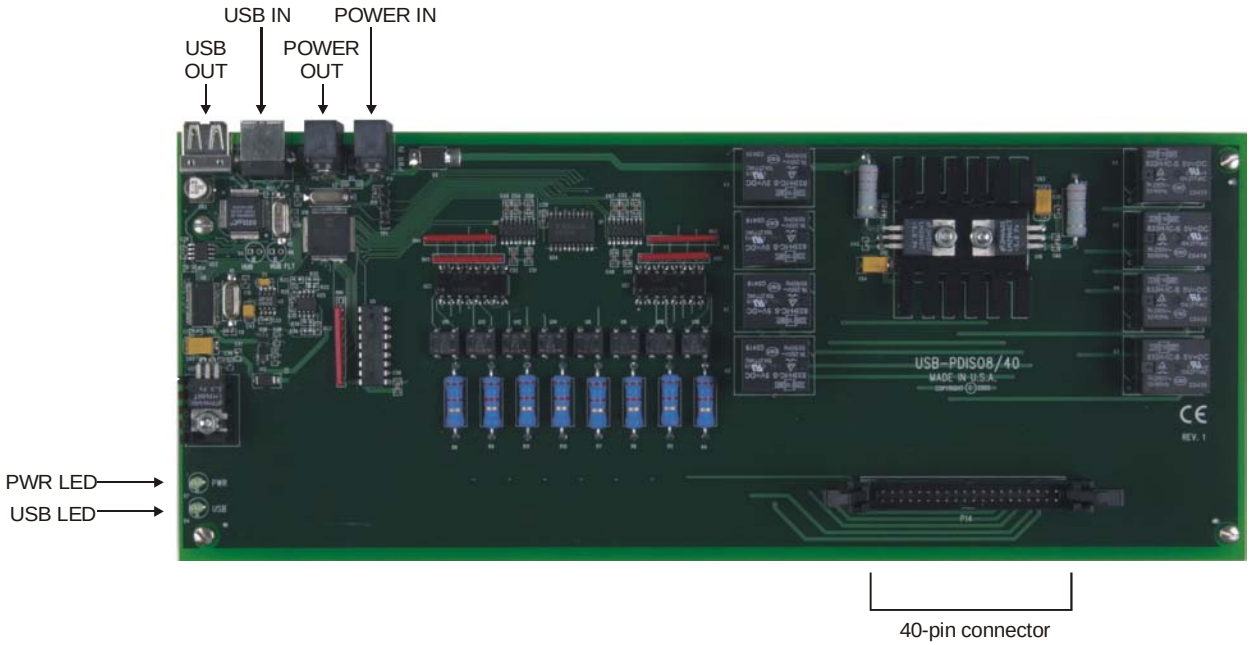


Figure 3-1. USB-PDISO8/40 components

USB OUT connector

The **USB OUT** connector is a downstream hub output port intended for use with other Measurement Computing USB products only. The USB hub is self-powered, and can provide 100 mA maximum current at 5 V. The USB out connector is labeled **USB OUT** on the enclosure and on the board.

For information on daisy chaining to other compatible Measurement Computing USB products, refer to "Daisy chaining additional modules to the USB-PDISO8/40" on page 3-3.

USB IN connector

Connect the **USB IN** connector to the USB port on your computer (or USB hub connected to your computer). The USB in connector is labeled **USB IN** on the enclosure and on the board.

External power connectors

The USB-PDISO8/40 has two external power connectors labeled **POWER IN** and **POWER OUT** on the enclosure. The **POWER IN** connector is labeled **PWR IN** on the board, and the **POWER OUT** connector is labeled **PWR OUT** on the board.

To supply external power, connect the **POWER IN** connector to the supplied +9 V external power supply (CB-PWR-9).

The **POWER OUT** connector lets you power additional daisy chained Measurement Computing USB products from a single external power supply. The C-MAPWR-*x* cable is available from MCC to connect additional Measurement Computing USB products.

USB LED

The **USB** LED indicates the communication status of the USB-PDISO8/40. This LED uses up to 5 mA of current and cannot be disabled. Table 3-1 explains the function of the USB LED.

Table 3-1. USB LED illumination

USB LED illumination	Indication
Steady green	The USB-PDISO8/40 is connected to a computer or external USB hub.
Blinks continuously	Initial communication is established between the USB-PDISO8/40 and the computer, or data is being transferred.

PWR LED

The USB-PDISO8/40 incorporates an on-board voltage supervisory circuit that monitors the external 9 V power supply. If the input voltage falls outside of the specified ranges the **PWR** LED shuts off (see Table 3-2).

Table 3-2. PWR LED illumination

PWR LED illumination	Indication
Steady green	+9 V external power is supplied to the USB-PDISO8/40.
Off	Input power is not supplied, or a power fault has occurred. A power fault occurs when the input power falls outside of the specified voltage range: External power (+9 V): 6.5 V to 12.5 V

Direct current (dc) power connector and +9 V power supply

The USB-PDISO8/40 requires between 6.5 V and 12.5 V of external power. An external power connection is required to activate the relays and to run tests in *Insta*Cal.

The USB specification allows high power devices to draw up to 500 mA. When all eight relays are energized, the collective current draw exceeds the maximum allowed for high power USB devices. Therefore, external power is required.

Use the +9-volt (V) DC power supply cord shipped with the USB-PDISO8/40 to provide external power to this connector.

Daisy chaining additional modules to the USB-PDISO8/40

Daisy chained MCC USB Series products connect to the USB bus through the high-speed hub on the USB-PDISO8/40. You can daisy chain a maximum of four Measurement Computing USB products to a single USB 2.0 port on your computer, or a maximum of two devices to a single USB 1.1 port. Use the supplied cable or an equivalent cable for daisy chaining to additional MCC USB Series products.

To daisy-chain two or more USB-PDISO8/40 modules, follow the steps below. This procedure assumes you already have one USB-PDISO8/40 connected to a computer and to the external power source. The USB-PDISO8/40 already connected to the computer is referred to as the *connected module*. The USB-PDISO8/40 you want to daisy-chain to the connected module is referred to as the *new module*.

1. Connect the **Power OUT** connector on the connected module to the **POWER IN** connector on the new module.
2. Connect the **USB OUT** connector on the connected module to the **USB IN** connector on the new module.
3. For each additional module you want to add, repeat steps 1-2, with the module you just daisy chained now being the *connected module.*

An example of a daisy chain system is shown in Figure 3-2.

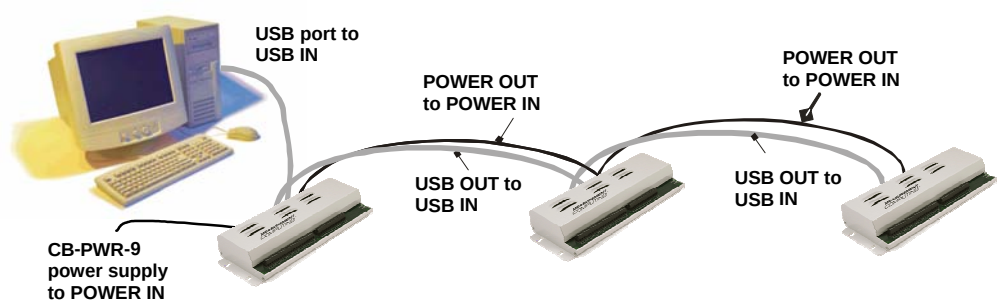


Figure 3-2. USB-PDISO8/40 daisy-chain connections (configuration not near full power load)

Power limitations using multiple USB-PDISO8/40 devices

When daisy chaining additional Measurement Computing USB products to the USB-PDISO8/40, you must ensure that you provide adequate power to each module that you connect. The USB-PDISO8/40 is powered with a 9 VDC nominal, 1.0 A external power supply.

When connecting multiple modules, power supplies with higher current capability are available from MCC, such as the CB PWR-9V3A.

Supply current

Running one USB-PDISO8/40 with all relays "on" draws 820 mA from the 1 A supply. When using the USB-PDISO8/40 under full load conditions, you cannot daisy chain additional Measurement Computing USB modules unless you supply external power to each module in the chain.

If you are not sure how much current your application requires, we recommend that you provide separate power to each Measurement Computing USB product that you connect.

Voltage drop

A drop in voltage occurs with each module connected in a daisy chain system. The voltage drop between the module power supply input and the daisy chain output is 0.5 V maximum. Factor in this voltage drop when you configure a daisy chain system to ensure that at least 6.5 VDC is provided to the last module in the chain.

A daisy chain system in a full-power-load configuration is shown in Figure 3-3.

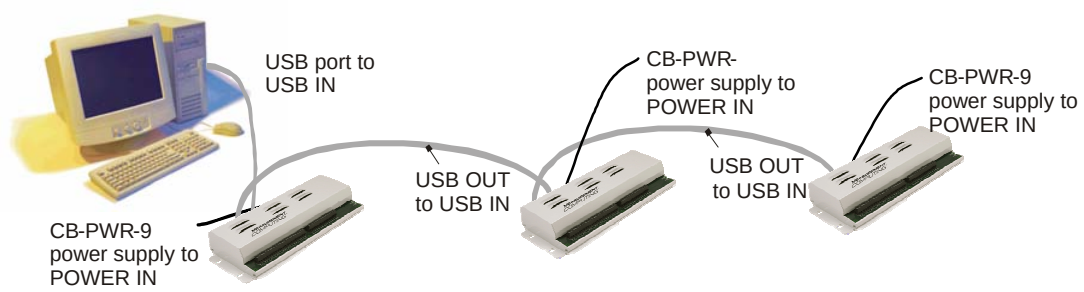


Figure 3-3. USB-PDISO8/40 daisy-chain connections (configuration requiring full power load)

Relay contact protection circuit for inductive loads

When you connect an inductive load to a relay, energy stored in the inductive load can induce a large voltage surge when you switch the relay. This voltage can severely damage the relay contacts. To limit the voltage surge across the inductive load in a DC circuit, install a kickback diode across the inductive load. Refer to the contact protection circuit in Figure 3-4. For AC loads, install a metal oxide varistor (MOV).

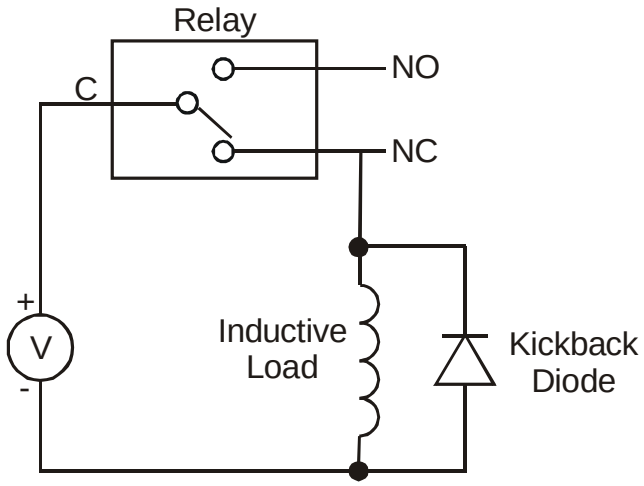


Figure 3-4. Relay contact protection circuit

Specifications

Typical for 25 °C unless otherwise specified.

Specifications in *italic text* are guaranteed by design.

Relay specifications

Table 1. Relay Output specifications

Number	8
Contact configuration	8 FORM C (SPDT) NO, NC and Common available at connector .
Contact rating	*6 amperes (A) @ 240 volts AC (VAC) or 28 volts DC (VDC) resistive (see connector rating below)*
Contact resistance	100 milliohms (mΩ) max
Operate time	*10 milliseconds (ms) max*
Release time	*10 milliseconds max*
Vibration	*10 to 55 hertz (Hz) (Dual amplitude 1.5 millimeters (mm))*
Shock	*10 G (11 ms)*
Dielectric isolation	*500 V (1 minute)*
Life expectancy	*10 million mechanical operations, min*
Power on RESET state	Not energized. NC in contact to Common.

Isolated inputs

Table 2. Isolated input specifications

Number	8		
Isolation	*500 volts (V)*		
Resistance	1.6k ohms (Ω) min.		
Voltage range	DC	Input high:	+5.0 VDC min or –5.0 VDC min
		Input low:	+1.5 VDC max. or –1.5 VDC max.
		Input range:	30 VDC max
	AC (with filter)	Input high:	6.0 V_{rms} min (50-1000 Hz)
		Input low:	1.5 V_{rms} max (50-1000 Hz)
Response	w/o filter	20 µs	
	w/ filter	5 ms	
Filters	Time constant	5 ms (200 Hz)	
	Filter control	Software programmable at each input.	
	Power-up /reset	Filters off	

Power

Table 3. Power specifications

Parameter	Conditions	Specification
USB +5 V input voltage range.		4.75 V min. to 5.25 V max.
USB +5 V supply current	All modes of operation	10 mA max
External power input		9 V nominal
External power supply (required)	MCC p/n CB-PWR-9	9 V ±10% @ 1 A
Voltage supervisor limits - PWR LED	6.5 V > V_{ext} or V_{ext} > 12.5 V (Note 1)	PWR LED = Off (power fault)
	6.5 V ≤ V_{ext} < 12.5 V	PWR LED = On
External power consumption	All relays on, 100 mA downstream hub power	820 mA typ, 900 mA max
	All relays off, 0 A downstream hub power	200 mA typ, 230 mA max

Note 1: The USB-PDISO8/40 monitors the external +9 V power supply voltage with a voltage supervisory circuit. If this power supply exceeds its specified limit, the **PWR** LED will turn off, indicating a power fault condition.

External power output

Table 4. External power output specifications

Parameter	Conditions	Specification
External power output - current range	Note 2	4.0 A max.
External power output	Voltage drop between power input and daisy chain power output	0.5 V max
Compatible cable(s) for daisy chain	C-MAPWR-x	x = 2 ,3 or 6 feet

Note 2: The daisy chain power output allows multiple USB Series products with a USB hub output port to be powered from a single external power source in a daisy chain fashion. The voltage drop between the module power supply input and the daisy chain output is 0.5 V max. Users must plan for this drop to assure the last module in the chain will receive at least 6.5 VDC

USB specifications

Table 5. USB specifications

USB "B" connector	Input
USB device type	USB 2.0 (full-speed)
Device compatibility	USB 1.1, USB 2.0
USB "A" connector	Downstream hub output port
USB hub type	Supports USB 2.0 high-speed, full-speed and low-speed operating points
	Self-powered, 100 mA max downstream VBUS capability
Compatible products	MCC USB Series products with a USB hub output port
USB cable type (upstream and downstream)	*A-B cable, UL type AWM 2527 or equivalent. (min 24 AWG VBUS/GND, min 28 AWG D+/D-)*
USB cable length	3 meters max.

Mechanical

Table 6. Mechanical specifications

Card dimensions	304.3 mm (L) x 121.9 mm (W) x 17.8 mm (H)
	12.0" (L) x 4.8" (W) x 0.7" (H)
Enclosure dimensions	342.9 mm (L) x 125.7 mm (W) x 58.9 mm (H)
	13.5" (L) x 4.95" (W) x 2.32" (H)

Environmental

Table 7. Environmental specifications

Operating temperature range	0 to 70 °C
Storage temperature range	-40 to 85 °C
Humidity	0 to 95% non-condensing

Main connector and pinout

Table 8. Main connector specifications

Connector	P14: 40-pin header
Compatible cables	C40FF-x: 40-conductor ribbon cable, female both ends, x = length in feet.
	C40-37F-x: 40-pin IDC to 37-pin female D connector, x = length in feet.
Compatible accessory products (using the C40FF-x cable)	CIO-MINI40
Compatible accessory products (using the C40-37F-x cable)	CIO-MINI37 SCB-37
Max current	1 A

P14

Pin	Signal Name	Pin	Signal Name
1	Input 7 terminal A	2	Input 7 terminal B
3	Input 6 terminal A	4	Input 6 terminal B
5	Input 5 terminal A	6	Input 5 terminal B
7	Input 4 terminal A	8	Input 4 terminal B
9	Input 3 terminal A	10	Input 3 terminal B
11	Input 2 terminal A	12	Input 2 terminal B
13	Input 1 terminal A	14	Input 1 terminal B
15	Input 0 terminal A	16	Input 0 terminal B
17	Relay 7 Common contact	18	Relay 7 Normally Open contact
19	Relay 6 Common contact	20	Relay 6 Normally Open contact
21	Relay 5 Common contact	22	Relay 5 Normally Open contact
23	Relay 4 Normally Closed contact	24	Relay 4 Common contact
25	Relay 4 Normally Open contact	26	Relay 3 Normally Closed contact
27	Relay 3 Common contact	28	Relay 3 Normally Open contact
29	Relay 2 Normally Closed contact	30	Relay 2 Common contact
31	Relay 2 Normally Open contact	32	Relay 1 Normally Closed contact
33	Relay 1 Common contact	34	Relay 1 Normally Open contact
35	Relay 0 Normally Closed contact	36	Relay 0 Common contact
37	Relay 0 Normally Open contact	38	Relay 7 Normally Closed contact
39	Relay 5 Normally Closed contact	40	Relay 6 Normally Closed contact

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